PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 :
C07B 53/00, 57/00, C07F 7/18, C07D 307/28, 309/18, C07F 11/00

A1

(11) International Publication Number: **WO 00/02834**

(43) International Publication Date: 20 January 2000 (20.01.00)

(21) International Application Number: PCT/US99/15816

(22) International Filing Date: 13 July 1999 (13.07.99)

(30) Priority Data:
09/114,692 13 July 1998 (13.07.98) US

(71) Applicant *(for all designated States except US)*: MASSACHUSETTS INSTITUTE OF TECHNOLOGY [US/US]; 77 Massachusetts Avenue, Cambridge, MA 02139 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: SCHROCK, Richard, R. [US/US]; 15 Cabot Street, Winchester, MA 01890 (US). HOVEYDA, Amir, H. [US/US]; 20 Preble Gardens Road, Belmont, MA 02178 (US).

(74) Agent: OYER, Timothy, J.; Wolf, Greenfield & Sacks, P.C., 600 Atlantic Avenue, Boston, MA 02210 (US).

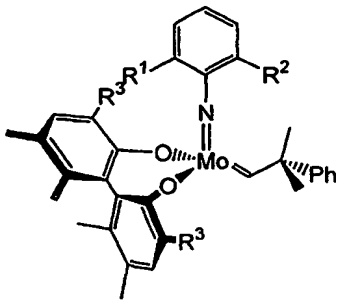
(81) Designated States: AU, CA, JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

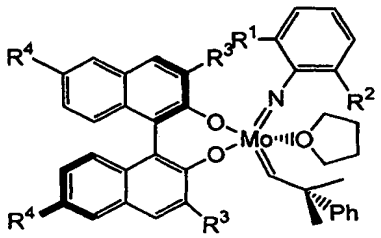
Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: ASYMMETRIC METATHESIS REACTIONS INVOLVING ACHIRAL AND MESO SUBSTRATES

(57) Abstract

A composition and method for the catalytic conversion of a racemic mixture of dienes to a cyclic olefin by a ring–closing metathesis (RCM) reaction are disclosed. The composition, a transition metal complex with an M=C reaction site, contains a bidentate dialkoxide of at least 80 % optical purity. Because the M=C reaction site is of a sufficient shape specificity, conferred in part by the dialkoxide of sufficient rigidity and a M=N–R^1 site, reacting the composition with a mixture of two enantiomeric dienes results in an olefin metathesis product that has at least a 50 % enantiomeric excess of one enantiomer in the mixture. A method is also provided for reacting a composition with a racemic diene mixture to generate a metathesis product that has an enantiomeric excess of at least 50 %. Methods are also provided for catalytic enantioselective desymmetrization. One method involves an olefin metathesis reaction with a molecular substrate having a plane of symmetry to form a product free of a plane of symmetry. Another method provides a desymmetrization reaction to occur in the absence of solvent. A method for producing quaternary carbon centers through a desymmetrization reaction is also described.





1a: R^3 = *t*-Bu; R^1 = R^2 = *i*-Pr
1b: R^3 = *t*-Bu; R^1 = R^2 = Me
1c: R^3 = adamantyl; R^1 = R^2 = *i*-Pr
1d: R^3 = adamantyl; R^1 = R^2 = Me
1e: R^3 = ethyl; R^1 = R^2 = *i*-Pr
1f: R^3 = ethyl; R^1 = R^2 = Me

2a: R^3 = 2,4,6-tri(*i*-propyl)phenyl; R^1 = R^2 = *i*-Pr;
2b: R^3 = 2,4,6-tri(*i*-propyl)phenyl; R^1 = R^2 = Me
2c: R^3 = *t*-Bu; R^1 = R^2 = *i*-Pr; R^4 = *t*-Bu
2d: R^3 = *t*-Bu; R^1 = R^2 = Me; R^4 = *t*-Bu
2e: R^3 = Ph; R^1 = R^2 = *i*-Pr; R^4 = H
2f: R^3 = Ph; R^1 = R^2 = Me; R^4 = H